Watson (B. A.)

Compliments of the Author.

THE DIAGNOSIS OF TRAUMATIC LESIONS IN THE CEREBRO-SPINAL AXIS, AND THE DETECTION OF MALINGERING REFERRED TO THIS CENTRE.

INDEX MEDICUS

BY

B. A. WATSON, M.D.,

CONSULTING SURGEON TO THE BAYONNE HOSPITAL; SURGEON TO THE JERSEY CITY HOSPITAL, ETC.

SURGEON GENL'S OFFICE
436
LIBRARY

FROM

THE MEDICAL NEWS,

June 6, 1891.

[Reprinted from THE MEDICAL NEWS, June 6, 1891.]

THE DIAGNOSIS OF TRAUMATIC LESIONS IN THE CEREBRO-SPINAL AXIS, AND THE DETECTION OF MALINGERING REFERRED TO THIS CENTRE.

BY B. A. WATSON, M.D.,
CONSULTING SURGEON TO THE BAYONNE HOSPITAL; SURGEON TO THE JERSEY CITY HOSPITAL, ETC.

THE counterfeit cannot be detected without an accurate knowledge of the genuine, and, in addition to this, an exact knowledge of the counterfeit, together with a definite knowledge of the difference between the genuine and the counterfeit, is still imperatively required.

It therefore follows that whoever would attempt the detection of malingering should always be able to diagnosticate concussion of the brain and spinal cord. The proper performance of this task requires a full knowledge of the etiology, semeiology and pathology of the morbid condition under consideration. Let us therefore direct our attention to these essential factors of diagnosis, carefully analyzing each in order that we may more thoroughly comprehend their relation and bearing on each other. It is universally admitted that concussion of the spinal cord most commonly follows falls upon the feet, the buttocks, and less frequently upon the hands when both arms are out-stretched; gunshot wounds

SURGEON GENL'S OFFICE
438
LIBRARY

involving portions of the spinal column; a stroke of lightning; heavy blows delivered over the bones of the pelvis or in the line of the spinal column.

The direct effect of these falls and blows is the production of contusions of the soft parts, etc., which are more or less disorganized by these traumatic agents. The force of these agents is not by any means entirely expended in the production of these contusions, but there will be carried along the bony structures a vibratory motion which will also be imparted in varying degrees to the adjacent soft parts. A very fair idea may be gained of these vibratory movements by placing the hand on the apex of a bell, suspended in the air, while its base is struck with a metallic hammer; or by the touch of a properly keyed string of a musical instrument when it has been put in motion. The same vibratory motion may also be very well illustrated by tapping gently with the finger on a glass jar or other vessel which is partially filled with jelly and then watching the tremulous movements imparted to the contents by the slight blows delivered on the vessel. The attention of the medical profession has been frequently called to the peculiarities of concussive or vibratory force by French authors, but its physiological and pathological action has never received that careful study to which it is entitled. A very important factor which presents itself for our consideration in connection with the study of this force is the fact that it is not transmitted equally well by the various organs and tissues of animal bodies; and, consequently, a direct blow delivered on one part of the body may be entirely negative,

or result in the production of very little vibratory action, while on another part of the organism the results will be very marked. Thus a blow delivered directly on the nates will give rise to this concussive force and be transmitted along the spinal column to the bony walls of the skull, and from this structure to the brain itself, which is in such close contact with these bones. A portion of the same force will likewise be expended in varying degrees on those organs in intimate contact with this line traversed by the traumatic agent. The functional disturbances and the pathological changes in the various organs will depend on the physiological functions, weight, texture, etc., of the parts involved, and these need not be enumerated here.

A blow delivered on the feet, while the lower extremities are extended, will be transmitted to the bones of the pelvis and then along the spinal column. A somewhat similar result may possibly be produced by a fall on the hands when the arms are extended; though the force of this blow will be much diminished by reason of the anatomical differences in the parts, particularly the less intimate connection between the bones of the arms and the spinal column than exists between the bones of the lower extremities and this important highway for the transmission of concussive force. It should likewise be remembered that the more concentrated the direct traumatic force, *i. e.*, the smaller the area to which it is applied, the greater will be the amount of concussive force generated, while the other factors remain unchanged. Thus a blow covering an area of four square inches delivered

directly over any part of the spinal column will generate far more concussive force than it would if spread over the whole posterior region of the body. In fact, in the former case, if the blow was a severe one, functional derangements and pathological lesions might rationally be expected to follow from the concentrated nature of the concussive force, but in the latter they will be looked for in vain. There is a very marked difference between the concussion in the case of gunshot wounds produced by musket or rifle balls and that which follows heavy blows or falls; in the former the pathological changes are more circumscribed, while in the latter they may be considered general. Thus, a musket ball having found lodgement in the vertebral column, and in some degree having impaired its outer surface without producing any lesion of the osseous tissues within the canal, the spinal cord will frequently be found in an ecchymotic state at a point near the lesion in the spinal column. In connection with this subject, it may be stated that no single blow, however great its momentum, delivered on the anterior surface of the thorax or abdomen could rationally be expected to produce concussion of the spinal cord, since its force would be expended almost entirely on the visceral organs within these cavities. The study of the effects of lightning, and likewise those of electrical currents of both high and low degree of potency, possesses very great interest for the surgeon in connection with the consideration of concussive force.

The vibratory character of electrical currents is apparently identical with the other forms of con-

cussive force; and it is readily demonstrable that the physiological action, functional disturbances and pathological changes possess essentially the same characteristics. The fact has long been recognized by the ablest authorities that concussion is physiologically indicated by a nervous and circulatory excitation or depression. In accordance with this opinion Verneuil has given the following definition of concussion: "A series of phenomena more or less sudden followed by a mechanical disturbance of the anatomical elements, tissues, and organs, characterized by a temporary excitation or a depression of the functions of the parts disturbed, and likewise producing anatomical changes, are generally observed in cases of functional activity or repose." Mechanical concussive force, like lightning strokes and electrical currents, may produce every possible degree of concussion, varying from the slightest functional disturbances which pass off within a few seconds, to instantaneous death. Further similarity in the effects of these agents is shown by the fact that concussion and even death may be produced by rapidly repeated mechanical blows or a rapid succession of electrical strokes, while a single impulse would be scarcely sufficient to cause even temporary functional disturbance. The pugilist knows that to render his antagonist unconscious the blows should be delivered upon the head. He therefore seeks to deliver in rapid succession blow after blow until his object is accomplished. Experimentation on animals has shown that concussion

of the brain may be caused by slight taps with a hammer delivered on the head in rapid succession.

In our consideration of the etiology of concussion of the cerebro-spinal axis we have said little in regard to its causation in the brain. It is probably understood, however, that those agencies which have already been mentioned are the important factors in its production in this organ as well as in the other organs of the body. The same general laws pertaining to the etiology of this morbid condition are as applicable here as elsewhere, consequently a blow delivered on the head will be more efficacious in the production of concussion of the brain than would be the concussive force had it been transmitted to this organ from some other part of the body. Furthermore, the weight of this organ and its other anatomical peculiarities must receive due consideration.

In the attempt to describe the symptoms of concussion in the cerebro-spinal axis we immediately encounter a difficulty arising from the fact that the functions of these organs are materially different, and consequently the symptoms observed in connection with a traumatism in the spinal cord will produce entirely different symptoms from those found when a similar lesion exists in the brain. The remedy for this difficulty is very simple and only requires that the symptoms be separately noted as they pertain to lesions in the different organs. A much more serious obstacle is found in the combination of all sorts of injuries with those of *pure* concussion, especially those having their origin in fractures, dislocations, sprains, rupture, and stretch-

ing of ligaments, particularly in the spinal column, and likewise with the concussion in one organ the symptoms of which are erroneously attributed to this morbid condition in another. In illustration of the above-mentioned error, I desire to call attention to the fact that hæmaturia is frequently mentioned as a symptom of concussion of the spine, while I have conclusively shown by my experiments on animals that it bears no constant relation to lesion of the cord, but, on the contrary, following concussive accidents, *indicates a concussion of the kidney.*

Furthermore, visual changes are frequently attributed to concussion of the spine, although as a matter of fact the lesions on which these changes depend are situated either in the brain or the eye. I am now prepared to assert that the greater part of the organs within the thorax and abdomen are equally as liable to suffer from concussive force as the brain itself; and likewise that concussive accidents are much more frequent in these visceral organs than in the spinal cord. This assertion is based on the fact that these lesions are entirely analogous to those observed in the brain, merely requiring that the proper allowance be made for differences in weight, texture, etc., factors which must be taken into consideration in connection with the study of the lesions of concussion in the brain and spinal cord. Furthermore, every true concussion takes its origin in the same peculiar force. Therefore, if it be desirable to speak of concussion of the brain, spinal cord, etc., why should it not be applied to the lungs, liver, kidneys, etc.?

Would it not be absurd to speak of gunshot wounds of the brain and spinal cord, while the term is withheld from analogous lesions caused by the same peculiar force in other parts of the body? An attempt has recently been made to employ the term "nervous shock" instead of concussion; but this departure possesses no advantage and has already caused much confusion. No attempt is here made to deny that certain portions of the nervous system participate in the concussion; although it is self-evident that the functional disturbance and pathological lesions are primarily developed in connection with the *circulatory system*. These preliminary comments are made in preference to any attempt at the mere enumeration of symptoms, which, in order to possess real value, must be fully stated and explained. It should likewise be remembered that there are different degrees of concussion and these differences are indicated by a corresponding difference in symptoms.

It must now be apparent that the limits of this article compel me to economize space, so far as it can be done without defeating the object for which it was written. Permit me, therefore, once more to call attention to the fact that concussion always produces either excitation or depression, *i. e.*, functional activity or repose. The former condition possesses practically little interest, if observed immediately after the application of the concussive force, since it is commonly of short duration, and does not require any attempt at treatment. However, there is another form of excitation occasionally observed in severe cases of concussion of the

brain which commonly makes its appearance from twelve to forty-eight hours after the receipt of the injury. This condition is indicated by a full pulse, flushed face, throbbing of the carotids, headache, hot and dry skin, photophobia, noises in the ears, and sometimes marked drowsiness. These symptoms point to the existence of cerebral hyperæmia, which is commonly of short duration; but in some cases it is the prelude to inflammation of the brain. In the severe cases of concussion of the brain or spinal cord the prompt appearance of *symptoms indicative of depression* commonly suggests the existence of organic lesions, rather than mere functional disturbances; while, as a general rule, the degree of danger is fairly expressed by the depression. It should, however, be remembered that the symptoms of depression, in order to possess any special value, must pertain especially to the functions which are known to be performed by these organs. Therefore, a diminished consciousness, although the patient may be aroused sufficiently to answer questions, the pupils contracted or dilated, relaxation of the sphincters, a feeble and irregular pulse, shallow and sighing respirations, a cold, pale, and clammy skin, are symptoms that point very clearly to the brain as the seat of the injury when the symptoms have followed promptly after the application of concussive force. The symptoms following those above recorded belong to the reactionary period; the object of this paper does not require their mention here. Concussion of the spinal cord is most commonly indicated by the appearance of paralytic symptoms, which frequently

involve the lower extremities, especially the motor power and likewise in many cases also the sensory. Therefore in our experiments made on dogs our attention was promptly directed to the movements of these animals immediately after the application of the concussive force.

The following facts possess an important bearing on the subject now under consideration. From a recent summary made from my "Experimental Study of Lesions arising from Severe Concussion" I shall here venture to cite the following: "Paraplegia is a very important indication of a lesion of the spinal cord and may have its origin either in a disease or traumatism. This morbid condition may be either complete or incomplete, and when due to disease it is commonly slowly progressive; but if due to traumatism it is rapidly manifested and soon reaches its fullest development. In support of this statement examine the following facts: The whole number of cases in which pathological changes were found in the cerebro-spinal axis was fifty; the whole number of cases in which any indications of these lesions were observed during the life of these animals was thirty-three, while our record shows that in the last-mentioned class there were twenty-three cases of paraplegia."

It will here be observed that there were ten cases in which there had been noted during the lifetime of these animals some indication of traumatism, but which did not exhibit during that period paraplegic symptoms. It is also worthy of notice that in every instance these paraplegic symptoms were observed immediately after the application of the concussive

force; and, furthermore, that in all cases of complete paraplegia there was not a single case which subsequently improved. In the large majority of cases of incomplete paraplegia there was commonly some improvement observed during the first three days, but in a few instances the paraplegic symptoms became more marked during the first twenty-four hours; however, even these cases soon showed signs of improvement. It is not claimed that even the immediate appearance of paralytic symptoms after the application of concussive force establishes, in all cases, the existence of pathological lesions in the spinal cord. I am strongly impressed with the idea that an injury of the peripheral nerves may be followed by temporary, and commonly, local paralysis. A certain degree of importance should be attached to the existence of either anæsthesia or hyperæsthesia in all cases where lesions of the spinal cord are suspected. The existence or absence of pain in these cases possesses very little interest for the diagnostician. In fact, the existence of pain and soreness ought probably to be looked on as having their origin in a contusion, sprain, or wrench, involving the vertebral ligaments, muscles, etc., rather than indicating lesions of the cord. Having now presented a few of the characteristic symptoms of true concussion of the brain, and likewise of the spinal cord, I desire in this connection to add that it is certainly very unfortunate for the science of surgery that it has hitherto been the custom of nearly all authors, writing on what they have unfortunately designated *concussion*, to group together half a dozen or more traumatic conditions, differing radically from each

other in their *etiology*, *semeiology*, and *pathology*. It requires no prophet to assert positively that so long as this grouping is continued there will be a want of clearness in all these articles; that theory will be frequently introduced in the place of scientific facts; that clinical observation will continue to mislead the profession; that good-natured authors, believing that all their predecessors in writing on this subject have told a little truth, will still further add to the existing confusion in their attempts at compounding these incompatible ideas. Let me ask what would be the inevitable result, if medical authors should group together under the unfortunate cognomen of "Smith's disease," scarlatina, diphtheria, rubeola, roseola, variola, typhus fever, etc.? But this combination is no more objectionable than that grouped under the name of "railway spine," which is so frequently employed by so many of our surgical authors even at the present time. However, the dawn of a new light may be approaching, since Dr. John A. Lidell, in writing on "Injuries of the Back, including those of the Spinal Column, Spinal Membranes, and the Spinal Cord," states that "The traumatic lesions of the back naturally arrange themselves in three groups, as follows:

"1. Injuries of the integuments and muscles, or soft parts generally.

"2. Injuries of the vertebral column.

"3. Injuries of the spinal membranes, spinal cord, and spinal nerves."[1]

[1] The International Encyclopædia of Surgery, vol. iv. p. 668. Edited by John Ashhurst, Jr., M.D. New York: Wm. Wood & Co., 1884.

It must be apparent that this classification presents many important advantages over that commonly employed. Another serious source of confusion has arisen from the fact that the term concussion was, in former times, restricted in its application to the brain, although analogous pathological lesions were produced by the same force in nearly all the organs of the body.

Furthermore, concussion was badly defined by the old authors; because the term was used to indicate a condition induced by a more or less violent shaking of the brain, whereby serious symptoms were produced without lesions of the structures. Recent experiments on animals and a careful study of this subject have entirely failed to support their statements in regard to the non-existence of lesions after concussive accidents in the brain and spinal cord. The results of my experiments were very conclusive in regard to the existence of these lesions. There were fifty cases in which pathological changes were observed in the cerebro-spinal axis, but only thirty-three of these cases showed any symptoms of injury of this centre during life; it will, therefore, be readily seen that in seventeen cases, although pathological lesions existed, they were not made apparent by symptoms which could be recognized in the animals. It is also noteworthy that there was not a single case in which the existence of concussion of the cerebro-spinal axis was even suspected, wherein by our subsequent examination, we failed to discover pathological lesions, *post-mortem* or *microscopical*. These pathological lesions in true concussions are certainly unique in character and nearly

or quite pathognomonic in significance. The only lesions that bear semblance to the pathological changes of concussion are those arising from contusions, and these are localized and not distributed generally throughout the organ, as is commonly the case in the former morbid condition. However, there is found an exception to these rules in the case of concussion following gunshot wounds, in which the injury is commonly localized and more or less closely resembles the ecchymotic appearance arising from contusions. The functional disturbances and the pathological lesions are clearly shown in my experiments to have had their origin in the vasomotor system. In order to illustrate the pathological changes in the spinal cord which have been observed to follow in a mixed or complicated case of concussion of this organ, I will here cite the report of an autopsy, etc.,[1] made on the body of a coal-porter, who had died thirty-four hours after the accident:

"*Autopsy*: There was no external trace of injury. The membranes of the cord were healthy. The substance of the cord was contused opposite the fourth and fifth cervical vertebræ. On section there was found ecchymosis of the posterior horns of gray matter on the left side, and of the adjacent part of the lateral and posterior columns. There were also limited spots of ecchymosis on the right side, one in the right posterior column and one in the right anterior horn of gray matter. The gray substance, generally, was hyperæmic. On removing the spinal

[1] International Encyclopædia of Surgery, vol. iv. p. 790 et seq. Edited by John Ashhurst, Jr., M.D. New York: Wm. Wood & Co., 1884.

cord and membranes nothing abnormal was discovered in the vertebræ until the posterior ligament had been dissected off, when it was seen that the body of the fourth was separated from that of the fifth, and the left articular process of the fourth had been chipped off."

Dr. John A. Lidell, who reports this autopsy, comments on it as follows: "The essential features of this instructive case are as follows: (1) The cord substance was injured by concussion and not by any displacement of the parts. (2) The injury was attended by a number of minute extravasations of blood (ecchymoses) in the gray substance. (3) There were anæsthesia and loss of motion in both lower extremities and in the left arm. (4) There was paralysis of the sphincter ani and sphincter vesicæ, which denoted that the reflex motor apparatus was also paralyzed. (5) The anæsthesia passed away in the course of some hours, the return of sensibility being noted first in the parts most distant from the injury. (6) Hyperæsthesia appeared synchronously with the reaction from 'shock,' and steadily increased in severity. (7) Hyperæmia of the gray substance was found as well as ecchymosis. It should be remarked that the hyperæsthesia was more severe in the right arm than elsewhere, and this part had not at any time been paralyzed." This case was reported by Dr. Lidell as a pure or uncomplicated one of spinal concussion, but I am compelled to question the correctness of the report in this particular, and direct attention to the ruptured ligament which it seems to me may have permitted a partial dislocation to have taken place,

with contusion of the cord, the vertebræ afterward having been restored to their proper position by the natural resilience of the parts. The symptoms of paralysis were certainly more marked than they are usually in cases of pure, uncomplicated concussion of the spinal cord. The following microscopical report conveys a very clear idea of the pathological lesions observed in our experiments on animals in the cerebro-spinal axis when there were no complications in this centre:[1] "Brain intensely hyperæmic, otherwise normal. Every portion of the cord intensely hyperæmic. There were punctate hæmorrhages in the dorsal and cervical regions of the spinal cord, in both the anterior and posterior horns, also in the middle commissure."

The striking analogy existing between the lesions in cases of death caused by electricity and the other cases of concussion may be probably better illustrated by citing the report of the autopsy made by Dr. Carlos F. McDonald on the body of William Kemmler after execution by electricity, since this examination has been more carefully detailed than any of the others. The others, however, entirely agree with McDonald's, so far as given. McDonald's report is as follows: "Rigor mortis marked. On incising the skin over the sternum the blood which escaped was unusually dark and fluid and remained so on exposure. Lungs: Tardieu spots were noticed on the posterior border of the lower lobe of the left lung, also in the middle lobe of the right lung.

[1] An Experimental Study of Lesions arising from Severe Concussion, p. 22 et seq. By B. A. Watson, M.D. Philadelphia: P. Blakiston, Son & Co., 1890.

Heart: Valves and substance normal, ventricles empty. Liver: Blood from cut surface of dark-crimson hue. Gall Bladder: Distended with bile. Spleen: Normal. Kidneys: Both markedly congested. Brain: *Capillary hæmorrhages* were noted in the floor of the fourth ventricle, also in the third ventricle, and in the anterior portion of the lateral ventricle. The perivascular spaces seemed to be distended with serum and blood." Dr. Spitzka's report of the preliminary microscopical examination is as follows: "The brain, spinal cord, and peripheral nerves appeared strictly healthy in every part examined, except in the area corresponding to the discolored (anæmic through the contraction of the vascular channels) area of the Rolandic and pre-Rolandic regions, the ventricular surface, the pons and the medulla oblongata. The latter, which had been the seat of post-mortem preservation of temperature approaching that of the normal human body, were distinctly softer than the observer has ever been accustomed to find these parts in autopsies on persons of Kemmler's age, so soon after death. The hæmorrhagic spots in the fourth ventricle, which were strongly marked, were not accompanied by signs of parenchymatous rupture of large bloodvessels. Hence they may be regarded as having the same significance as the 'taches de Tardieu' found on the surfaces of the organs, notably the heart and lungs. The peculiar softened vesicular zone of tissue underlying the outermost layer of the cerebral cortex is noteworthy as 'the destruction line,' and runs parallel to the free surface of the brain without

dipping with the sulci. Examination of the fresh specimen revealed the existence of vacuoles (probably gas bubbles) in the ganglion cells and in the parenchyma of the destruction line. From the fact that no hæmorrhages had occurred in this softened area, it is a just inference that it was produced after life had become entirely extinct, for the continuance of a blood circulation in a softened brain area is incompatible with the bloodless appearance already noted, and the absence of capillary hæmorrhages in this very district, while they were present in those remote from the site of the electrode."

In order to approach the consideration of *malingering* it is necessary to devote some attention to the traumatic conditions which frequently complicate concussion in the cerebro-spinal axis; since the majority of authors still include these morbid conditions under the head of "spinal concussion," "railway spine," etc. Fractures and dislocations of the vertebræ require little attention at the present time, since they are generally easily diagnosticated, the only exception to this rule being those cases where there is a complete absence of deformity, which may be the case where the fracture consists in chipping off a portion of the articular vertebral surface, etc., or in an incomplete dislocation of a vertebra in which the natural resiliency of the ligaments and muscles has restored the symmetry of the parts. In these cases, it is thought that the careful and observing surgeon will not be compelled to remain long in doubt as to whether the patient before him is a malingerer or suffering from a real traumatic injury—since the prompt appearance of

objective symptoms will certainly be largely dependent on the locality of the injury, while their degree of severity will depend very much upon the extent and character of the traumatism.

There now remain for our consideration in this connection contusions, sprains, twists and wrenches of the back, which on account of their medico-legal bearings are entitled to a more thorough analysis than can be given them in this article. The study of these morbid conditions will be greatly simplified by bearing in mind that their symptoms, the primary and secondary effects, are entirely analogous to injuries of the same character in other parts of the body. It is claimed that the spinal column and the bones which connect directly with it are provided with ninety-nine articulations. The symptoms which characterize the morbid conditions now under consideration are pain, swelling, tenderness under pressure, and occasional ecchymoses. The existence of the symptoms will be limited to the area involved in the traumatism, while the degree of severity will depend on the intensity of the injuries. In some cases there may be constitutional disturbances which will aid in establishing the existence of a morbid condition. The ecchymoses and swelling are objective symptoms, and consequently entitled to due consideration, while the pain, stiffness, and tenderness under pressure may require confirmation. The verification of the patient's statements on these points, and frequently on others, especially questions involving the existence of paralysis, might be definitely put at rest by the proper use of an anæs-

thetic, which ought to be frequently employed in medico-legal cases. The general surgeon no longer hesitates to employ this agent in his private and public practice for diagnostic purposes; and why should it not be thus employed for the purpose of securing justice in our courts?

Drunkenness and syncope may make the diagnosis more difficult in certain cases of concussive accidents, whether it be pure or complicated concussion; but these factors are of short duration, and therefore cannot long continue to embarrass the surgeon.

It is unfortunately too frequently the case that a surgeon commences his examination in medico-legal contests after *having fully formed an opinion*, or at least a bias or prejudice. In many cases, in fact almost universally, this arises from the want of an analytical mind and of any carefully arranged system of examination. These are very serious defects in the expert witness, and when fully demonstrated should disqualify him from testifying. There is another serious defect frequently observed in the members of our profession, which sometimes has its origin in laziness, although occasionally in an inordinate greed, where the physician has been accustomed all his life to give an opinion to a patient without either an examination or thought. It will be perceived that I have not yet reached the case of the malingerer; but I have thus far merely paid my respects to those who aid and assist the malingerer. The malingerer is certainly entitled to a careful and thorough examination, and each surgeon employed in the case ought to proceed in his examination

with the same degree of care and caution that the most conscientious chemist would exercise when required to make a chemical analysis in the interest of justice. It therefore becomes highly important to learn the true history of the litigant, and likewise that of his father, mother, brothers, and sisters. All these matters have a special bearing on the case. It will be readily admitted that any person who has established a good character for truthfulness and honesty ought not to be classed with a mere adventurer. In the examination of all the factors involved in these cases of so-called "railway spine" the fact should never be lost sight of that *correct scientific opinions can only be reached by a systematic, methodical, and painstaking investigation.*

Let us here present a brief *résumé* of some of the points which have been more or less considered in this paper:

1. As used by those who first employed it, the term concussion was erroneously defined, and in its application, unfortunately restricted to the brain. These errors had their origin in a deficient knowledge of the pathological lesions engendered by concussive force.

2. Concussion is a more or less violent shaking or agitation of various organs in the body, producing functional derangements dependent on vasomotor changes and well-defined pathological lesions.

3. Concussion may be either general or special—general when several organs are involved at the same time, or special when the entire concussive force is expended on a single organ.

4. The symptoms arising from concussion will

chiefly depend on the extent of the pathological lesions and the functions of the organs.

5. The frequency with which concussion will occur in any particular organ will depend on the point to which the concussive force is applied; the relative weight of the organ; the character of its texture; the protection afforded by its anatomical surroundings.

6. The fifth statement supplies the explanation of the comparatively frequent occurrence of concussion of the brain, lungs, liver, and kidneys, as compared with that of the spinal cord.

7. Concussion of the brain and spinal cord is always attended with immediate symptoms.

8. Concussion of the brain or spinal cord without immediate symptoms is a mere hypothesis, a myth, and has no real existence.

9. There is no pathognomonic symptom of concussion in any organ of the body, but a thorough, systematic, methodical examination by a skilled surgeon will secure a correct diagnosis.

Finally, I desire to reiterate the fifth conclusion, expressed by Dr. Henry Hollingsworth Smith in a paper which he read before the surgical section of the American Medical Association in 1889, and which is as follows: "No physician should go into court and swear that a plaintiff has had a concussion of the spinal cord, or of its nerves, unless he has proved the disturbance of the normal functions of the cord, as shown in sensation, or motion, or both, and that the symptoms appeared *soon* after the injury."

THE MEDICAL NEWS.

A National Weekly Medical Periodical, containing 24-28 Double-Columned Quarto Pages of Reading Matter in Each Issue. $4.00 per annum, post-paid.

That THE NEWS fulfils the wants of men in active practice is made clear by the steady growth of its subscription list. This increase of readers has rendered possible a reduction in the price of THE NEWS to **$4.00** per year, so that it is now by far the cheapest as well as the best large weekly journal published in America.

Every mode of conveying serviceable information is utilized. The foremost writers, teachers and practitioners of the day furnish original articles, clinical lectures and notes on practical advances; the latest methods in leading hospitals are promptly reported; a condensed summary of progress is gleaned each week from a large exchange list, comprising the best journals at home and abroad; a special department is assigned to abstracts requiring full treatment for proper presentation; editorial articles are secured from writers able to deal instructively with questions of the day; books are carefully reviewed; society proceedings are represented by the pith alone; regular correspondence is furnished by gentlemen in position to know all occurrences of importance in the district surrounding important medical centres, and minor matters of interest are grouped each week under news items. Everything is presented with such brevity as is compatible with clearness, and in the most attractive manner. In a word, THE MEDICAL NEWS is a crisp, fresh, weekly newspaper, and as such occupies a well-marked sphere of usefulness, distinct and complementary to the ideal monthly magazine, THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES.

The American Journal of the Medical Sciences.

Published monthly. Each number contains 112 octavo pages, illustrated. $4.00 per annum, post-paid.

In his contribution to *A Century of American Medicine*, published in 1876, Dr. John S. Billings, U. S. A., Librarian of the National Medical Library, Washington, thus graphically outlines the character and services of THE AMERICAN JOURNAL: "The ninety-seven volumes of this Journal need no eulogy. They contain many original papers of the highest value; nearly all the real criticisms and reviews which we possess; and such carefully prepared summaries of the progress of medical science, and abstracts and notices of foreign works, that from this file alone, were all other productions of the press for the last fifty years destroyed, it would be possible to reproduce the great majority of the real contributions of the world to medical science during that period."

COMMUTATION RATE.—Postage paid.

THE MEDICAL NEWS, published every Saturday,
THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, monthly, ... } in advance, $7.50.

LEA BROTHERS & CO., 706 and 708 Sansom St., Phila.